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Part IV

Environmental Protection Agency

Organic Solvent Cleaners; Standards of Performance for New Stationary Sources; Proposed Rule and Notice of Public Hearing

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 60

FRL 1375-3]

Standards of Performance for New Stationary Sources Organic Solvent Cleaners

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule and notice of public hearing.

SUMMARY: The proposed standards would limit emissionsof volatile organic compounds (VOC) and trichloroethylene 1,1,1-trichloroethane, perchloroethylene, methylene chloride, and trichlorotrifluoroethane from new, modified, and reconstructed organic solvent cleaners (degreasers) in which solvents are used to clean (degrease) metal, plastic, fiberglass, or any other type of material. The proposed standards would specify several equipment designs and work practices for controlling emissions from cold cleaners, open top vapor degreasers, and conveyorized degreasers. When carbon adsorber control systems are used, a performance standard would also apply. To determine the emissions from carbon adsorbers, a new test method, Reference Method 23, is proposed to measure the concentration of the above mentioned halogenated compounds, and Reference Method 25 which was proposed on October 5, 1979 (44 FR 57792) would be used to measure emissions of VOC.

The proposed standards implement the Clean Air Act and are based on the Administrator's determination that organic solvent cleaners contribute significantly to air pollution. The intent is to require new, modified, and reconstructed organic solvent cleaners to use the best demonstrated system of continuous emission reduction, considering costs, nonair quality health, and environmental and energy impacts.

It is also proposed that standards be developed under section 111(d) of the Clean Air Act, as amended, for the control of emissions from existing facilities of the five halogenated organic solvents listed above. EPA is not committed to developing section 111(d) standards unless, after review of public comments, standards for one or more of these five solvents are promulgated for new, modified, or reconstructed facilities. If such standards were promulgated, EPA would develop a guideline document that would require States to develop emission control regulations for existing organic solvent cleaners which use any of the five halogenated solvents to which the promulgated regulations would apply.

A public hearing will be held to provide interested persons an opportunity for oral presentation of data, views, or arguments concerning the proposed standards.

DATES: *Comments.* Comments must be received on or before August 25, 1980.

Public Hearing. The public hearing will be held on July 24, 1980, beginning at 9:00 a.m.

Request to Speak at Hearing. Persons wishing to present oral testimony should contact EPA by July 17, 1980.

ADDRESSES: *Comments.* Comments should be submitted (in duplicate if possible) to the Central Docket Section (A-130), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460, Attention: Docket No. OAQPS-78-12.

Public Hearing. The public hearing will be held at Research Triangle Park, North Carolina, in the EPA Environmental Research Center auditorium (Room B-102). Persons wishing to present oral testimony should notify Deanna Tilley, Standards Development Branch (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number: (919) 541-5421.

Background Information Document. The Background Information Document (BID) for the proposed standards may be obtained from the U.S. EPA Library (MD-35), Research Triangle Park, North Carolina 27711, telephone number (919) 541-2777. Please refer to *Organic Solvent Cleaners—Background Information for Proposed Standards* (EPA-450/2-78-045a).

Docket. Docket number OAQPS-78-12, containing supporting information used by EPA in development of the proposed standards, is available for public inspection between 8:00 a.m. and 4:00 p.m., Monday through Friday, at EPA's Central Docket Section, Room 2903B, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT: Mr. John D. Crenshaw, Standards Development Branch, Emission Standards and Engineering Division (MD-13), Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5421.

SUPPLEMENTARY INFORMATION:

Proposed Standards

The proposed standards would limit the emissions of organic solvents from new, modified, and reconstructed degreasers in which solvents are used to clean and degrease metal, plastic, fiberglass, or any other type of material. Three types of degreasers would be regulated: cold cleaners, open top vapor degreasers, and conveyorized degreasers. The proposed regulations consist of a combination of design, equipment, work practice, and operational standards that allow for the best emission control and enforceability. Each type of degreaser would be required to have specific features for effectively reducing emissions. Pollution control devices for degreasers would include covers, raised freeboards, refrigerated freeboard devices and carbon adsorption systems. Work practices and operational procedures would also be required for each type of degreaser. These practices and procedures would assure the maximum effectiveness of a specific piece of control equipment, and would require use of techniques that reduce solvent emissions.

An inspection and maintenance program would also be required to prevent and correct solvent losses from leaks and equipment malfunctions. An operator training program is a proposed requirement because proper equipment operation and work practices play a significant role in effective control of solvent emissions from degreasers. Finally, owners and operators would be required to keep records on the amount and type of solvent purchased for a period of two years.

Summary of Environmental, Economic, and Energy Impacts

Environmental Impact. The proposed standards would reduce emissions of organic solvents (i.e., volatile organic compounds, trichloroethylene, 1,1,1-trichloroethane, perchloroethylene, methylene chloride, and trichlorotrifluoroethane) from all degreasing units for which construction was commenced after (date of proposal). Affected facilities that come on-line between 1980 and 1985 would emit an estimated 332,000 megagrams (366,000 tons) of organic solvents in 1985, if the degreaser units are uncontrolled. With implementation of the proposed regulations, controlled emissions from these facilities would be 120,000 megagrams (132,000 tons) in 1985, which constitutes a reduction of 64 percent.

The only potentially adverse impact on water quality of the proposed regulation would derive from the solvent dissolved in the steam condensate from regeneration (solvent desorption) of carbon adsorbers. Because the solubility of solvent in the condensate is very small, the amount of dissolved solvent is

slightly greater than one-tenth of one percent (0.1%) of the amount which would be discharged into the air if the proposed controls were not implemented. In a typical system, the carbon adsorber has a solvent capacity of 95 kilograms (210 pounds), and requires 3 kilograms (6.6 pounds) of steam to desorb each kilogram of solvent. Although desorption generates approximately 283 liters (10 cubic feet) of steam condensate per cycle, most solvent would be recovered by a water separator. Only 74 grams (0.16 pound) of solvent per day is expected to be lost in the waste stream from a typical carbon adsorber. The environmental impact of the disposal of this small amount of condensate is insignificant. Alternatives are under consideration by EPA for controlling the solvent in the effluent from desorption of a carbon adsorber. EPA may establish regulations pertaining to these effluents in the future.

The only solid waste impact due to implementation of the proposed standards would be disposal of the spent carbon from the carbon adsorbers used as air pollution control devices on certain types of degreasers. With replacement of spent carbon every 10 years, disposal of spent carbon from carbon adsorbers on affected facilities would amount to 243 megagrams (268 tons) nationwide starting in 1989 and would increase to 271 megagrams (299 tons) in 1995. Therefore, the solid waste impact from spent carbon would be minimal.

Economic Impact. The costs of compliance with the proposed standards are based on control equipment currently in use and commercially available. Economic analysis indicates that, under most conditions, the capital and annualized costs for the control equipment can be fully recovered by credits for the recovered solvent. Consequently, no adverse economic impact is anticipated to result from implementation of the proposed standards. The economic impact, may, in fact, be positive in the sense that net credits lead to lower production costs in most, if not all, industries. Methods to reduce solvent consumption and save money generally have not been accomplished in the past since degreasing costs generally average less than four-tenths of one percent of industry output.

Energy Impact. Energy consuming emission control devices for degreasing operations would include (1) refreigerated freeboard devices, (2) carbon adsorption systems, and (3) distillation equipment. Operation of these control devices in 1985 is estimated to require about 0.27 million kWh per day (equivalent to 440 barrels of oil per day); however, the proposed standards would result in the prevention or capture of degreaser emissions. Based upon the amount of energy that would have been required to manufacture replacement solvent, use of the required control devices on new organic solvent cleaners would conserve an estimated 3800 barrels of oil per day. Thus, the proposed standards in 1985 would result in a net conservation of energy equivalent to an estimated 3350 barrels of oil per day.

Rationale—Selection of Source for Control

Organic solvent cleaners (degreasers) have been identified as significant sources of air pollutant emissions which cause or contribute to the endangerment of the public health or welfare. Degreasing is not an industry but is an integral part of many manufacturing, repair, and maintenance operations. Volatile organic compounds, as well as 1,1,1–trichloroethane, trichlorotrifluoroethane, methylene chloride, trichlorethylene, and perchloroethylene constitute the emissions from organic solvent cleaners. There were an estimated 725,000 megagrams (800,000 tons) of organic solvents emitted from organic solvent cleaning operations in 1975. This represents about 4 percent of the total national volatile organic emissions from stationary sources, making organic solvent cleaners the fifth largest stationary source category for organic emissions. There are over 1,500,000 organic solvent cleaners currently in operation. If the current growth rate of 4.1 percent per year continues as expected, over 300,000 new organic solvent cleaners would be subject to these standards of performance by 1985.

Degreasing emissions include losses due to evaporation from the solvent bath, convection, carryout, leaks, and waste solvent disposal. Thus, the emissions from a degreaser are fugitive in nature. Many of the degreasers currently in use are operated without proper control emissions to the atmosphere. Emissions from degreasers may be controlled by the use of various equipment options (including a cover, extended freeboard, refrigerated freeboard device, and carbon adsorber) and specific work practices (involving parts handling, proper use and maintenance of equipment, preventing drafts, and controlling the rate of the degreasing operation).

Based on the large number of sources and their wide geographic distribution across the United States, the current sales and projected growth rate in the "industry" and the possible reduction in adverse environmental and health impacts which can be achieved, organic solvent cleaners have been selected for control through the development of standards of performance.

Selection of Affected Facilities

Organic solvent cleaning is not a specific industry but is an integral part of many manufacturing, repair, and maintenance operations. Practically every business that works metal or has maintenance or repair operations does some type of degreasing. Degreasing operations are often concentrated in urban areas where there are a large number of manufacturing facilities.

The solvents used in degreasing operations include halogenated hydrocarbons, petroleum distillates, ketones, ethers, and alcohols. These solvents are emitted as fugitive emissions from each of the three types of degreasers which would be regulated: (1) a cold cleaner, in which the article to be cleaned is immersed, sprayed or otherwise washed in a solvent at or about room temperature; (2) an open top vapor degreaser, in which the article is suspended in solvent vapor over a pool of boiling solvent and the solvent vapors condense on the article and dissolve or wash soil and grease from it; and (3) a conveyorized degreaser, in which articles are conveyed on a chain, belt or other conveying system either through a spray or pool of cold solvent, or through the vapor of a boiling solvent. In order to achieve significant reduction in volatile organic compound emissions from degreasing operations, all types of new, modified, or reconstructed degreasers would subject to control.

The mode of disposal of waste solvent can also contribute significantly to solvent emissions. In the past, disposal has generally been handled by the owners of organic solvent cleaners. If waste solvent disposal in 1985 were to follow the pattern of waste solvent disposal in 1974, about 43 percent of the waste solvent from new sources would be reclaimed, incinerated, landfilled and the remaining 57 percent could be an immediate source of air or water emissions.

A number of alternatives for regulating waste disposal have been considered. These include requiring incineration or reclamation, and establishment of standards under the Resource Conservation and Recovery Act (RCRA). Because of the impact on these small sources of requiring reclamation or incineration, regulation here is not now planned. Rather, the

Administrator is deferring at this time on waste disposal requirements and is pursuing this matter under RCRA. The section on waste disposal is being reserved, however, pending completion of the evaluation and resolution of the issues.

Selection of Pollutants and Regulatory Approach

Among the solvents used in degreasing operations, approximately 40 percent are non-halogenated hydrocarbons and 60 percent are halogenated hydrocarbons. Most of these solvents are also reactive volatile organic compounds (VOC), defined by this proposal as organic compounds which participate in atmospheric photochemical reactions or which may be measured by the applicable reference method specified under any subpart of 40 CFR Part 60. The proposed standards of performance apply to reactive VOC (ozone precursors) used as cleaning solvents and to five halogenated compounds for which there is a reasonable anticipation of public health endangerment.

Reactive Volatile Organic Compounds (VOC).

The proposed standards require control of any VOC demonstrated to be precursors to the formation of ozone and other photochemical oxidants in the atmosphere. While not all compounds are equally reactive, analysis of available data indicates that very few VOC are of such low photochemical reactivity that they can be ignored in oxidant control programs. EPA's "Recommended Policy on Control of Volatile Organic Compounds" (42 FR 35314; July 8, 1977) affirmed that many compounds which produced negligible oxidant concentrations during initial smog chamber tests were found to contribute appreciably to ozone levels when exposed to multiday irradiations in urban atmospheres. In those geographical areas where industrial and automotive emissions are subjected to long hours of sunlight, or where air stagnation occurs frequently, such low reactivity compounds may become significant source of photochemical oxidant.

EPA is developing standards of performance under section 111(b) for a number of categories of sources which emit these volatile organic compounds, which are ozone precursors. Ozone air pollution endangers the public health and welfare, as reflected in the Administrator's promulgation of a National Ambient Air Quality Standard for ozone (44 FR 8202; February 8, 1979). Emissions of ozone precursors from these source categories cause or contribute significantly to ozone air pollution. Trichloroethylene and, to a lesser extent, perchloroethylene react to form ozone and therefore would be subject to new source performance standards for reactive VOC.

The Administrator is also concerned about certain other possible health effects of perchloroethylene and trichloroethylene, apart from their role in ozone formation, and he believes that regulation of existing emission sources is necessary. Both substances have been found to induce a high incidence of hepatocellular carcinomas (liver tumors) in mice and have shown positive results in bacterial mutagencity assays (a screening technique for potential carcinogens). The Agency's initial evaluation of this information is that it presents "substantial evidence" (41 FR 21402; May 25, 1976) that both substances are human carcinogens. Consistent with EPA's proposed rules for regulating airborne carcinogens (44 FR 58642; October 10, 1979), if these initial evaluations are sustained after consideration of comments by EPA's Science Advisory Board, it is likely that perchloroethylene and trichloroethylene will be classified as high-probability carcinogens and, in light of the significant emissions of each, regulated as hazardous air pollutants under section 112 of the Act. This regulation would include both new and existing emission sources.

It is also possible that the Administrator will ultimately conclude that one or both of these chemicals is a moderate-probability carcinogen rather than a high-probability carcinogen. As the proposed airborne carcinogen rules explain, under the circumstances presented here, EPA could then "designate" the substance for regulation of existing organic solvent cleaners by the States under section 111(d) of the Clean Air Act. The Act provides for the designation of such substances for regulation under section 111(d) if the substances themselves have not been listed previously under section 108 or section 112. Because the evidence is clearly sufficient for the Administrator to conclude that both substances are at least moderate-probability carcinogens and that their emission by organic solvent cleaners causes air pollution which endangers public health and welfare, he is proposing designation of these two substances under section 111(d) at this time. Although a final determination by the Agency of the evidence of carcinogenicity would normally precede the selection of a regulatory alternative, the Administrator is proposing designation of perchloroethylene and trichloroethylene today for two reasons. First, this will put existing sources within the industry on notice that perchloroethylene and trichloroethylene would not be unregulated substitutes for the other three solvents for which designation is proposed today. Second, in the event that the Administrator ultimately concludes that perchloroethylene and trichloroethylene are moderate-probability rather than high-probability carcinogens, it will enable the section 111(d) process to proceed without delay as part of a coordinated regulatory program for the organic solvent cleaning industry. The Administrator intends to make a final carcinogenicity assessment for these two chemicals before promulgating today's proposals.

Negligibly Reactive Halogenated Compounds.

In addition to reactive halogenated compounds, the proposed new source regulations would apply to three additional halogenated solvents: 1,1,1-trichlorethane, methylene chloride, and trichlorotrifluoroethane. Since these chemicals are acknowledged by EPA to be negligibly reactive, they are not ozone precursors and must be designated under section 111(d) of the Act. As described above, the designation for the purpose of obtaining coverage under new source standards also requires the development under section 111(d) of standards for existing sources.

Both methylene chloride and 1,1,1-trichlorethane have scored positive as well as negative results in short-term mutagenicity and cell transformation tests. The weight of evidence has led the EPA Carcinogen Assessing Assessment Group to conclude in preliminary assessments that both chemicals exhibit suggestive evidence of human carcinogenicity. Under EPA's proposed airborne carcinogen policy, this finding would establish 1,1,1-trichlorethane and methylene chloride as candidates for regulation under section 111 as air pollutants "reasonably anticipated to endanger public health or welfare." In addition, trichlorotrifluoroethane and 1,1,1-trichlorethane have been implicated in the depletion of the stratospheric ozone layer, a region of the upper atmosphere which shields the earth from harmful wavelengths of ultraviolet radiation that increase skin cancer risks in humans.

The judgments of whether and to what extent 1,1,1-trichlorethane and methylene chloride are human carcinogens, and 1,1,1-trichlorethane and trichlorotrifluoroethane deplete the

ozone layer, are issues of considerable debate. While the scientific literature has been previously reviewed and summarized in the docket prepared for this rulemaking, more detailed health assessments are currently in preparation by EPA's Office of Research and Development. These assessments will be completed and submitted for external review, including review by the Science Advisory Board, prior to the promulgation of the regulations and the proposal of EPA guidance to States in developing existing source control measures. The extent to which the preliminary findings are affirmed by the review process may affect the final rulemaking for new as well as existing sources.

While the measure of concern is less for these latter three solvents than for perchloroethylene and trichloroethylene, the Administrator has chosen to proceed with the designation of 1,1,1-trichlorethane, methylene chloride, the trichlorotrifluoroethane at this time because emissions from these sources and the associated health risks can be reduced at a very low cost. This decision reflects EPA's concern that continued growth in uncontrolled emissions of 1,1,1-trichlorethane, methylene chloride, and trichlorotrifluoroethane from solvent cleaners may endanger public health, and is reinforced by projections that, were these chemicals exempted from regulation, the resulting substitution of exempt for non-exempt solvents could result in large increases in the emissions of these pollutants.

The designation of 1,1,1-trichlorethane, methylene chloride, and trichlorotrifluoroethane incorporates these chemicals under today's proposed new source standards and invokes section 111(d) which requires States to develop controls for existing sources. As described in detail below, the new source standards do not place unreasonable economic costs on the industry. While the impact of similar controls on existing sources could be more significant due to the technological problems associated with retrofit, this factor would be an important consideration in determining the appropriate control level for existing sources. In view of the substantial reduction in emissions which can be achieved at low cost, and the potential for substitution between these five compounds, the Administrator is persuaded that the present approach represents a prudent policy to protect public health. It should be emphasized that the health assessments discussed here are not final. The Administrator is aware of other relevant information that may become available. All applicable information will be carefully evaluated prior to making the final regulatory decision.

Summaries of the health basis for designating perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, methylene chloride, and trichlorotrifluorethane are available in the public rulemaking docket described at the beginning of this notice.

Selection of Format for the Proposed Standards

Under the Clean Air Act, as amended, there are two regulatory alternatives available for establishing standards of performance for new stationary sources. Section 111(b) provides for establishing emission limitations or percentage reductions in emissions. However, when such standards are not feasible to prescribe or enforce, section 111(h) of the Clean Air Act provides that EPA may instead promulgate a design, equipment, work practice, or operational standard, or combination thereof. In either event, the standards prescribed would require new, modified, and reconstructed organic solvent cleaners to use the best demonstrated system of continuous emission reduction considering costs, nonair quality health and environmental impacts, and energy impacts. The emissions from organic solvent cleaners are unconfined (fugitive). Although techniques have been developed to measure the solvent lost from degreasing equipment (such as mounting entire organic solvent cleaners on scales), these methods are impractical for enforcement of regulations due to the length of time needed to accurately determine the solvent losses and because of the disruption this would cause in degreaser operations. For this reason, an equipment and work practice standard has been selected since it is not feasible to enforce emission limitations or percentage reductions in emissions for organic solvent cleaning operations.

Selection of the Best System of Emission Reduction

Emissions of volatile organic compounds from degreasers would be reduced significantly by the use of various pollution control devices, singly or in combination, as would be appropriate for each method of degreasing. These controls would include: cover, drain rack, raised freeboard, refrigerated freeboard device, downtime port covers, hanging flaps, and drying tunnel or lip exhaust in conjunction with a carbon adsorber. Degreaser emissions would be reduced further through the implementation of prescribed work practices. These work practices would include: closing the cover when work is not being lowered into or removed from the degreaser, storing solvent in covered containers, not exposing open degreasers to steady drafts with velocities exceeding 40m/min (131 ft/min), and not overloading the degreaser.

The best system of emission control for each type of degreaser was selected on the basis of EPA tests of the effectiveness of various controls used on degreasers operating under different conditions and using different solvents. These are described as follows:

Cold Cleaners.—The emission control system selected for cold cleaners (CC) would consist of both control equipment and a series of work practices. These controls used in combination would reduce solvent emissions from cold cleaners by about 80 percent. The equipment requirements would include a cover, a drain rack, and a visible fill line. The cover would be designed to be readily opened and closed at any time. External drain racks would lead the drainage back to the tank. If the CC is equipped with a parts basket, internal hooks to permit suspension of the basket above the solvent could be substituted for the drain rack. One of the work practices would require that the solvent level not exceed the visible internal maximum fill line. The proposed standards would require that the freeboard ratio for CC would be at least 0.7 if the solvent vapor pressure is greater than 4.3 kPa (33 mm Hg or 0.6 psi) measured at 38° C (100° F). The purpose for this is to prevent excessive volatilization, i.e. vaporization. Higher freeboard ratios impede excess vaporization of highly volatile solvents under normal operating conditions. However, many solvents used in cold cleaning operations do not volatilize as rapidly as others. For solvents with a vapor pressure of less than or equal to 4.3 kPa measured at 38° C (100° F), the proposed standards would require a freeboard ratio of 0.5.

The economic analysis for this emission control system for cold cleaners was based on a typical unit. The uncontrolled cold cleaner was assumed to be uncovered all the time, whereas the controlled unit had a cover that was used all but 2 hours per working day (20 loads cleaned per day). Based on these assumptions, the cover would reduce emissions by 349 kilograms (769 pounds) per year at a savings of $69.80. The drain rack would reduce emissions by 36 kilograms (79 pounds) per year with a savings of $7.92.

Remote Reservoir Cold Cleaner.—The emission control system selected for remote reservoir cold cleaners (RRCC) is less stringent than that proposed for conventional cold cleaners. During non-use periods, the solvent is enclosed in a reservoir and not subject to evaporation loss to the atmosphere. While parts are being cleaned, solvent is pumpted through a sink-like work area which drains back into the enclosed contaier. Because the reservoir is remote from the work area, this type of organic solvent cleaner is not subject to the evaporation losses suffered by conventional cold cleaners. Therefore, the proposed standards for remote reservoir cold cleaners would not require closable covers, provided the solvent used has a vapor pressure of less than or equal to 4.3 kPa (33 mm Hg or 0.6 psi) measured at 38° C (100° F), but would require covers if the solvent volatility was greater than 4.3 kPa.

Open Top Vapor Degreaser.—The emission control systems would be required for all new, modified, or reconstructed open top vapor degreasers (OTVD) consists of covers, raised freebacks, and refrigerated freeboard devices or carbon adsorption systems. EPA and industry tests have shown that covers are the most effective control device in reducing solvent emissions during nonoperating conditions. Raised freeboards have also been show to be effective at reducing these emissions. By raising the freeboard ratio from 0.5 to 0.75, solvent emissions are generally reduced 25–30 percent during idling conditions. Emission reductions are less during actual operating conditions due to the transference of loads through vapor/air interface. Freeboard ratios larger than 0.75 may yield greater emission reductions, however, higher freeboards tend to icrease the difficulty of transferring loads into and out of the degreaser. The demonstrated ability of covers and raised freeboards to reduce solvent emissions, and the minimal cost of these two control devices have been the primary reasons for requiring the use of covers during nonoperating periods and freeboards ratios of at least 0.75 for all new, modified, and reconstructed open top vapor degreasers.

Emission tests have also shown that refrigerated freeboard devices and lip exhausts connected to carbon adsorbers are more effective at reducing solvent emissions than raised freeboards. During operating conditions, emission reductions as high as 65 percent have been demonstrated with the use of carbon adsorbers, while refrigerated freeboard devices have been demonstrated to reduce solvent emissions by at least 40 percent. A raised freeboard ratio of 1.0 has also shown promise (55 percent reduction), but its effectiveness under cross-draft conditions has not been adequately evaluated. It is expected that the cold air blanket produced by a refrigerated freeboard device would provide greater control of cross-draft induced vapor losses. For these reasons, all new, modified, and reconstructed OTVD with vapor/air interface areas greater than one square meter would be required to use refrigerated freeboard devices, or have lip exhausts connected to carbon adsorbers.

Reference Method 23, "Determination of Halogenated Organics from Stationary Sources," would be the required test method to measure emissions of the regulated halogenated compounds from carbon adsorbers. The principle of the method is an integrated bag sample of stack gas that is subjected to gas chromatographic analysis, using flame ionization detection. The range of this method is 0.1 to 200 ppm. The emission limitation proposed by these standards of performance would be 25 ppm of any regulated halogenated organic compound measured over the length of the carbon adsorber cycle, or for three hours, whichever is less. The Administrator specifically requests comments on this proposed test method and emission limitation.

A cut-off size of one square meter was determined to be the most effective for OTVD, taking into consideration the absolute reduction in solvent emissions and economic analyses. Although the capital expenditures for refrigerated freeboard devices are greater than for raised freeboards, solvent savings would completely offset the added capital expenditures, provided the degreasers were operated properly. However, for small OTVD (less than 1 m^2 in open top area), refrigerated freeboard devices would not be a cost-effective alternative. Taking into consideration the small reduction in solvent emissions and economics, small open top vapor degreasers would not be required to have refrigerated freeboard devices.

EPA realizes that refrigerated freeboard devices with sub-zero (0°C) refrigerant temperatures are patented. If any degreaser manufacturer is unable to demonstrate alternative methods of control, and certifies that the licensing terms for sub-zero refrigerated freeboard devices are unreasonable, relief under section 308 of the Clean Air Act, as amended can be sought.

Although the proposed standards require specific control technologies, they do not preclude the use of other control options which are demonstrated to be equally effective in reducing solvent emissions. After proposal of these regulations, any person may request an equivalency determination. EPA expects to approve other methods of continuous emission reduction when they have been demonstrated to be as effective in reducing emissions as refrigerated freeboard devices. The Administrator will also welcome any additional data and information concerning the control efficiencies of raised freeboards and refrigerated freeboard devices. Tests are currently being conducted to investigate the effectiveness of refrigerated freeboard devices and increased freeboard ratios under cross-draft conditions. Preliminary results of these tests have shown varying test results for different solvents. Because of possible variation in test outcomes, additional tests are planned. Tests are also being conducted to evaluate the effectiveness of automated covers which close after the workload enters the degreaser. These test results and any additional information and data submitted to EPA during the public comment period will be used to further evaluate the appropriateness of the proposed emission control options. Expansion or deletion of these options will be evaluated prior to promulgation. All information obtained during the course of this investigation and received during the public comment period would be placed in the docket for public review and considered by EPA before taking final action to promulgate standards for new, modified, and reconstructed degreasers.

Conveyorized Degreasers.—There are two major types of conveyorized degreasers: conveyorized vapor degreaser (CVD) and conveyorized cold cleaners (CCC). Conveyorized vapor degreasers use the vapors of boiling solvent to clean and degrease surfaces, while conveyorized cold cleaners use non-boiling solvent in the liquid phase to clean surfaces. The emission control system selected for conveyorized degreasers consists of both control equipment and a series of work practices. Using these controls in combination will reduce solvent emissions from conveyorized degreasers by 60 percent.

The two major emission control requirements for CVD are carbon adsorbers or refrigerated freeboard devices, provided the CVD is greater than 2 square meters (21.6 ft^2) in vapor/air interface area. This cutoff size was determined to be the most effective, taking into consideration the absolute

reduction in solvent emission and economic analyses. For larger crossrod and monorail CVD, carbon adsorbers produce greater emission reductions at higher savings than do refrigerated freeboard devices. For owners or operators of small crossrod and monorail degreasers, the capital costs of a carbon adsorber could be prohibitive. Because of this, a refrigerated freeboard device may be used instead of a carbon adsorber. As with OTVD, the type of conveyorized vapor degreaser, the type of work being processed, and ambient conditions would determine which emission control system should be used.

For conveyorized cold cleaners, the major emission control requirement would be a carbon adsorber, provided the CCC is greater than 2 square meters (21.6 ft^2) in solvent/air interface area. Like CVD, this cutoff was determined to be the most effective, taking into consideration the absolute reduction in solvent emissions and economic analyses. Refrigerated freeboard devices would not be an option for CCC since they are only effective in reducing emissions of warm solvent vapors.

Equivalent Systems of Emission Reduction

These standards of performance do not preclude the use of other degreaser emission control equipment or procedures of operation which can be demonstrated to be equivalent, in terms of reducing solvent emissions, to those prescribed in the proposed regulation. For determination of equivalency, any person may write the Administrator of EPA and request approval of a test plan for demonstrating equivalency. The test plan must propose the use of specific equipment, test procedures, a date, and a U.S. location at which the person making the request wishes to demonstrate equivalency. In order to determine equivalency, the Administrator must find a substantial likelihood that the control technology used in normal operations would produce equivalent emission reductions as the standards would require, at approximately the same or less economic, energy, or environmental cost. An alternate equipment design would not be considered equivalent to the proposed requirements if it placed a greater burden upon the personnel operating the degreaser to manually operate the emission capture device (e.g., use of an automated cover could potentially be found equivalent to use of refrigerated freeboard devices, but a manually operated cover would not qualify). Automated operation of the emission control system is required because manual operation would be burdensome due to the frequency with which work enters and exits open top vapor degreasers (cycle times of only 6 minutes are not unusual) and because enforcement of these standards would primarily depend upon equipment certifications. Although work practices could not be substituted for equipment design requirements, alternatives to the work practices contained in the proposed standards could also be included in an equivalency determination.

Selection of Enforcement Methods

More than 325,000 new degreasers are expected to be in operation by 1985. The large number of degreasers precludes the inspection of all units on a periodic basis. Therefore, enforcement must be achieved through a combination of degreaser manufacturer certifications and EPA random inspections. Because EPA cannot inspect all degreasers that will be in operation, adherence to the work practices will basically depend upon voluntary compliance. Although the work practices are important, the equipment design requirements will be the primary mechanism for ensuring the control of organic solvent emissions from degreasing operations. A random inspection program would be designed to inspect all degreaser design types produced, but would cover only a sample of shops using degreasing equipment. To facilitate this program, the primary reporting burden would be place upon the manufacturers of degreasing equipment.

Under section 111(a)(5) of the Clean Air Act, as amended, manufacturers of degreasers would be considered owners until the degreasers are sold. Thus, the original manufacturer of a newly constructed degreaser would be responsible for making the proposed reports. Section 114(a)(1) of the Act specifies that the Administrator can require owners or operators to report information to EPA as may be reasonably required. Manufacturers of cold cleaners, remote reservoir cold cleaners, open top vapor degreasers, and conveyorized degreasers would be required to notify the Administrator of the date construction began on a new degreaser, certain equipment features, and the name, date and location to whom the ownership of the degreaser was transferred. This information would be reported once for each degreaser constructed, modified, or reconstructed and the reports would be submitted each quarter. If any manufacturer or other owner or operator feels that the information to be submitted is proprietary in nature, a request for confidential treatment can be submitted with the report. On September 1, 1976, EPA promulgated regulations (40 CFR part 2) which govern the treatment of confidential business information, including that obtained under section 114 of the Clean Air Act.

Under certain circumstances, the operator of the degreaser rather than the original manufacturer would be responsible for making the report. This would occur when a modification or reconstruction to an existing degreaser was made by any person other than the original manufacturer or when any affected degreaser is resold.

Certification would be supplemented by an EPA inspection program of representative types of models of degreasers from owners and operators selected at random. This program would determine compliance with the design requirements for all new degreasing equipment, and would determine compliance with the work practice and operational requirements by a random sample of degreasing operations. Inspection would include a visual check of the operation and an examination of the methods of waste solvent disposal.

This method of enforcement has been selected as the best option considering the savings in time and money for effective enforcement. As mentioned previously, the large number of new sources expected within the next five years prohibits inspection of each unit. Effort has been made to reduce the proposed reporting and recordkeeping burdens to the minimum needed to administer an effective enforcement program. EPA also considered requiring each degreaser operator to report directly to EPA upon installation of a new degreaser and to periodically report work practice methods in use. However, the reporting requirements would have caused an excessive burden to be placed on each degreaser operator and would have caused the generation of a large number of reports. For these reasons, the proposed reporting requirements are minimized to include a one-time report per degreaser of a few basic items. In addition, spot checks of representative types and models of degreasers in operation were selected as the best available option. Operators of degreasing equipment would only be required to keep records of solvent usage and disposition and would not be required to make written reports. These records can be discarded after a two year period. To further reduce the impact of these requirements, operators of small cold cleaners (less than 1 m^2), such as are commonly used in gasoline service stations, would be exempt from any recordkeeping or reporting except

for maintaining a simple record of the disposition of waste solvent.

Public Hearing

A public hearing will be held to discuss these proposed standards in accordance with section 307(d)(5) of the Clean Air Act. Persons wishing to make oral presentations should contact EPA at the address given in the ADDRESSES Section of this preamble. Oral presentations will be limited to 15 minutes each. Any member of the public may file a written statement with EPA before, during, or within 30 days after the hearing. Written statements should be addressed to the Central Docket Section (A–130), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460, Attention: Docket No. OAQPS–78–12.

A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at EPA's Central Docket Section, Room 2903B, Waterside Mall, 401 M Street, SW., Washington, D.C. 20460.

Docket

The docket is an organized and complete file of all the information submitted to or otherwise considered by EPA in the development of this proposed rulemaking. The principal purposes of the docket are: (1) to allow interested parties to readily identify and locate documents so that they can intelligently and effectively participate in the rulemaking process, and (2) to serve as the record in case of judicial review [section 307(d)(7)].

Miscellaneous

As prescribed by section 111 of the Clean Air Act, as amended, establishment of standards of performance for organic solvent cleaners was preceded by the Administrator's determination (40 CFR 60.16, 44 FR 49222, dated August 21, 1979) that these sources contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare. In accordance with section 117 of the Act, publication of this proposal was preceded by consultation with appropriate advisory committees, independent experts, and Federal departments and agencies. The Administrator will welcome comments on all aspects of the proposed regulation, including economic and technological issues on the proposed test methods.

It should be noted that standards of performance for new sources established under section 111 of the Clean Air Act reflect:

> . . . application of the best technological system of contunuous emission reduction which (taking into consideration the cost of achieving such emission reduction, any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated [section 111(a)(1)].

Although there may be emission control technology available that can reduce emissions below those levels required to comply with standards of performance, this technology might not be selected as the basis of standards of performance due to costs associated with its use. Accordingly, standards of performance should not be viewed as the ultimate in achievable emission control. In fact, the Act requires (or has the potential for requiring) the imposition of a more stringent emission standard in several situations.

For example, applicable costs do not necessarily play as prominent a role in determining the "lowest achievable emission rate" for new or modified sources locating in nonattainment areas, i.e., those areas where statutorily-mandated health and welfare standards are being violated. In this respect, section 173 of the Act requires that new or modified sources constructed in an area which exceeds the National Ambient Air Quality Standard (NAAQS) must reduce emissions to the level which reflects the "lowest achievable emission rate" (LAER), as defined in section 171(3) for such category of source. The statute defines LAER as that rate of emissions based on the following, whichever is more stringent:

> (A) the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or
>
> (B) the most stringent emission limitation which is achieved in practice by such class or category of source.

In no event can the emission rate exceed any applicable new source performance standard [section 171(3)].

A similar situation may arise under the prevention of significant deterioration of air quality provisions of the Act (Part C). These provisions require that certain sources [referred to in section 169(1)] employ "best available control technology" (BACT) as defined in section 169(3) for all pollutants regulated under the Act. Best available control technology must be determined on a case-by-case basis, taking energy, environmental and economic impacts and other costs into account. In no event may the application of BACT result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard established pursuant to section 111 (or 112) of the Act.

In all events, State implementation plans (SIP's) approved or promulgated under section 110 of the Act must provide for the attainment and maintenance of NAAQS designed to protect public health and welfare. For this purpose SIP's must in some cases require greater emission reduction than those required by standards of performance for new sources.

Finally, States are free under section 116 of the Act to establish even more stringent emission limits than those established under section 111 or those necessary to attain or maintain the NAAQS under section 110. Accordingly, new sources may in some cases be subject to limitations more stringent than standards of performance under section 111, and prospective owners and operators of new sources should be aware of this possibility in planning for such facilities.

In order to prevent duplicative regulatory reuirements, and in order to avoid conflicts in standard setting, EPA has been in contact with representatives of the Interagency Regulatory Liaison Group (IRLG). This group, composed of members from EPA, the Occupational Safety and Health Administration (OSHA), the Food and Drug Administration (FDA), and the Consumer Product Safety Commission (CPSC) was formed in August, 1977, to ensure that the agencies work closely together in areas of common interest and responsibility. In particular, EPA has been in contact with OSHA to ensure that the requirements for the proposed standard do not conflict with OSHA's requirements for ventilation of open surface tank operations (29 CFR 1910.94).

Under EPA's sunset policy for reporting requirements in regulations, the reporting requirements in this regulation will automatically expire five years from the date of promulgation unless EPA takes affirmative action to extend them. To accomplish this, a provision automatically terminating the reporting requirements at that time will be included in the text of the final regulations.

EPA will review this regulation four years from the date of promulgation as required by the Clean Air Act. This review will include an assessment of such factors as the need for integration with other programs, the existence of alternative methods, enforceability, and improvements in emission control technology.

Section 317 of the Clean Air Act requires the Administrator to prepare an

economic impact assessment for any new source standard of performance promulgated under section 111(b) of the Act. An economic impact assessment was prepared for the proposed regulations and for other regulatory alternatives. All aspects of the assessment were considered in the formulation of the proposed standards to insure that the proposed standards would represent the best system of emission reduction considering costs. The economic impact assessment is included in the Background Information Document.

Dated: April 17, 1980.

Douglas M. Costle,

Administrator.

It is proposed to amend Part 60 of Chapter I, Title 40 of the Code of Federal Regulations as follows:

1. By adding alphabetically a definition of the term "volatile organic compound" to § 60.2 of Subpart A—General Provisions as follows:

§ 60.2 Definitions

* * * * *

"Volatile organic compound" means any organic compound which participates in atmospheric photochemical reactions or is measured by the applicable reference methods specified under any subpart.

2. By adding Subpart JJ as follows:

Subpart JJ—Standards of Performance for Organic Solvent Cleaners

Sec.

60.360 Application and designation of affected facility.
60.361 Definitions.
60.362 Standards for volatile organic compounds, trichloroethylene, 1,1,1-trichloroethane, perchloroethylene, methylene chloride, and trichlorotrifluoroethane.
60.363 Equivalent method of control.
60.364 Reporting and Recordkeeping.
60.365 Waste disposal. (reserved).
60.366 Test method.

Authority: Sec. 111, 301(a) of the Clean Air Act as amended [42 U.S.C. 7411, 7601(a)], and additional authority as noted below.

Subpart JJ—Standards of Performance for Organic Solvent Cleaners

§ 60.360 Applicability and designation of affected facility.

The provisions of this subpart are applicable to all organic solvent cleaners for which construction was commenced after (date of proposal) which are used for organic solvent cleaning (degreasing) of any materials.

§ 60.361 Definitions.

All terms used in this subpart, but not specifically defined in this Section shall have the meaning given them in the Act and in Subpart A of this part.

"Adsorption cycle" means a solvent recovery process which begins when solvent laden air is directed through an activated carbon bed, resulting in the capture of solvent vapors. An adsorption cycle shall be considered complete when the activated carbon bed becomes saturated with solvent, resulting in breakthrough of solvent vapors.

"Carbon adsorber" means a device in which an organic compound is brought into contact with activated carbon and is retained.

"Certification" means a written statement signed by the owner or operator of the affected facility.

"Cold cleaner" means any device or piece of equipment which contains and uses an organic solvent in the liquid phase to clean surfaces.

"Conveyorized cold cleaner" means any conveyorizer degreaser which uses an organic solvent in the liquid phase to clean surfaces.

"Conveyorized degreaser" means any device which uses an integral, continuous, mechanical system for moving materials or parts to be cleaned into and out of an organic solvent liquid or vapor cleaning zone.

"Conveyorized vapor degreaser" means any conveyorizer degreaser which uses an organic solvent in the vapor phase to clean surfaces.

"Drain rack" means any basket, tray, or sink located in, on, or exterior to a degreaser, which permits excess or condensed solvent to drain from the parts after degreasing and to return to the solvent bath.

"Drying tunnel" means an enclosed extension of the exit from a conveyorized degreaser.

"Equivalent method of control" means any method that can be demonstrated to the Administrator to provide at least the same degree of emission control as the specified control.

"Extended freeboard" means an addition to the sides of a degreaser to increase the freeboard height.

"Fill line" means a permanent mark in a degreaser tank that indicates the maximum operating liquid level recommended by the manufacturer.

"Freeboard height" means, for a cold cleaner, the distance from the liquid solvent level in the degreaser tank to the lip of the tank. For an open top vapor degreaser it is the distance from the solvent vapor level in the tank during idling to the lip of the tank. For a conveyorized cold cleaner it is the distance from the liquid solvent level to the bottom of the entrance or exit opening, whichever is lower. For a conveyorized vapor degreaser, it is the distance from the vapor level to the bottom of the entrance or exit opening, whichever is lower.

"Freeboard ratio" means a ratio of the freeboard height to the smaller interior dimension (length, width, or diameter) of the degreaser.

"Lip exhaust" means a device installed around the lip of a degreaser that draws in air and solvent vapor emissions and ducts them away from the degreaser area.

"Open top vapor degreaser" means any open top device or piece of equipment that contains and uses an organic solvent, at the boiling point of the solvent, and solvent vapor to clean equipment surfaces.

"Organic solvent" means any liquid substance which contains carbon and has the power to dissolve, causing solution.

"Organic solvent cleaner" or "degreaser" means any cold cleaner, remote reservoir cold cleaner, open top vapor degreaser, and conveyorized degreaser equipment and their ancillary components.

"Organic solvent cleaning" or "degreasing" means those processes using organic solvents to clean and remove soils from the surfaces of materials being processed.

"Refrigerated freeboard device" means a device which is mounted above the water jacket and the primary condenser coils, consisting of secondary coils which carry a refrigerant to provide a chilled air blanket above the solvent vapor to reduce emissions from the degreaser bath. The chilled air blanket temperature, measured at the centroid of the degreaser at the coldest point, shall be no greater than 30 percent of the solvent's boiling point (°F).

"Remote reservoir cold cleaner" means any device in which liquid solvent is pumped through a sink-like work area which drains back into an enclosed container while parts are being cleaned and in which the solvent in the enclosed container is not subject to evaporation losses to the atmosphere during non-use periods.

§ 60.362 Standards for volatile organic compounds, trichloroethylene, 1,1,1-trichloroethane, perchloroethylene, methylene chloride, and trichlorotrifluoroethane.

(a) Except as provided in paragraph (d) of this section, an owner or operator shall operate a cold cleaner, or a remote reservoir cold cleaner only if it has a cover that may be readily opened and

closed. A fusible link shall not interfere with cover operation.

(b) An owner or operator shall operate a cold cleaner only if it conforms to the following design requirements:

(1) A drain rack. If an external drain rack is used, it must allow the drained solvent to return to the solvent bath in the cold cleaner. If the cold cleaner is equipped with a parts basket, internal hooks to permit suspension of the basket above the solvent may be substituted for the drain rack.

(2) A freeboard ratio of at least 0.5. If the solvent used has a volatility greater than 4.3 kPa (33 mm Hg or 0.6 psi), measured at 38°C (100°F), the freeboard ration shall be at least 0.7.

(3) A visible fill line.

(c) Except as provided in paragraph (d) of this section, an owner or operator shall not operate a cold cleaner without meeting the following work and operational practices:

(1) The solvent level shall not exceed the fill line.

(2) When a flexible hose or flushing device is used, the pressure of solvent delivered by the pump may not exceed 69 kPa (10 psi), measured at the pump outlet, and the pumped solvent shall be delivered in a continuous stream and not a droplet spray. Flushing shall be performed only within the confines of the cold cleaner.

(3) When an air- or pump-agitated solvent bath is used, the agitator shall be operated so as to produce a rolling motion of the solvent but not observable splashing against tank walls or parts being cleaned.

(4) The cover shall be closed when the cold cleaner is not in use and when parts are being cleaned by solvent agitation.

(5) When the cover is open, the cold cleaner may not be exposed to drafts greater than 40 m/min (131 ft/min), as measured between 1 and 2 meters upwind and at the same elevation as the tank lip.

(6) Solvent cleaned parts shall be drained for 15 seconds or until dripping has stopped, whichever is longer. Parts having cavities or blind holes shall be tipped or rotated while draining.

(7) Waste solvent, still, and sump bottoms shall be collected and stored in closed containers. The closed containers may contain a device that would allow pressure relief, but would not allow liquid solvent to drain from the container prior to disposal.

(8) Each owner shall provide a permanent label for each cold cleaner which states the required work and operating practices. If the freeboard ratio on a cold cleaner is less than 0.7, the label shall state the types of solvents which may be used in the cold cleaner. Such solvents include xylenes, mineral spirits, stoddard solvents, or other solvents with a volatility less than or equal to 4.3 kPa. The label shall be placed near the front of the degreaser in full view of the degreaser operator and written in English, and any other language that may be necessary for comprehension by personnel operating the degreaser. The label must be kept visible and legible at all times. The plant owner or operator shall ensure that each person who operates a cold cleaner understands the instructions on the label.

(9) Spills during solvent transfer shall be wiped up immediately. The wipe rags shall be stored in covered containers.

(d)(1) An owner or operator who operates a remote reservoir cold cleaner which uses solvent with a volatility of less than or equal to 4.3 kPa (0.6 psi or 33 mm Hg) measured at 38°C (100°F), and which has a drain area less than 100 cm^2 (15.5 in^2) shall be subject to the provisions of paragraph (c)(2), (c)(5), (c)(6), (c)(7), (c)(8), and (c)(9).

(2) An owner or operator who operates a remote reservoir cold cleaner which uses solvent with a volatility greater than 4.3 kPa (0.6 psi or 33 mm Hg) measured at 38° C (100° F), or has a drain area greater than or equal to 100 cm^2 (15.5 in^2) shall be subject to the provisions of paragraphs (d)(1), (c)(4), and (a).

(e) An owner or operator shall operate an open top vapor degreaser only if it conforms to the following design requirements:

(1) Each open top vapor degreaser shall be equipped with a cover that may be readily opened or closed. If the open top vapor degreaser is equipped with a lip exhaust, the cover shall be located below the lip exhaust.

(2) Each open top vapor degreaser shall have a freeboard ratio of at least 0.75.

(3) Each open top vapor degreaser shall be equipped with the following devices:

(i) A device which shuts off sump heat if sump liquid solvent level drops down to the height of sump heater coils, and

(ii) A vapor level control device which shuts off sump heat if the vapor level rises above the height of the primary condenser.

(4) Each open top vapor degreaser greater than 1.0 square meter (10.8 ft^2) shall be equipped with one or more of the following equipment controls:

(i) A refrigerated freeboard device, or

(ii) A lip exhaust connected to a carbon adsorber. The concentration of organic solvent in the exhaust from this device shall not exceed 25 ppm of any regulated halogenated organic compound as measured by Method 23 for the length of the carbon adsorber cycle or three hours, whichever is less. If other volatile organic compounds are used, then the emissions shall not exceed an average of 25 ppm as carbon, measured by Method 25 for the length of the carbon adsorber cycle or three hours, whichever is less.

(f) An owner or operator shall not operate an open top vapor degreaser without meeting the following required work and operational practices:

(1) The cover shall be closed when parts are not being degreased.

(2) When the cover is open, the open top vapor degreaser shall not be exposed to drafts greater than 40 m/min (131 ft/min), as measured between 1 and 2 meters upwind and at the same elevation as the tank lip.

(3) For any open top vapor degreaser equipped with a lip exhaust, the exhaust shall be turned off when the degreaser is covered.

(4) Parts being degreased shall not occupy more than 50 percent of the vapor-air interface area.

(5) The vertical speed of a powered hoist, if one is used, shall not be more than 3.3 m/min (10.8 ft/min) when lowering and raising the parts.

(6) Spraying operations shall be done within the vapor layer.

(7) Work shall not be lifted from the vapor layer until condensation or dripping has stopped. Parts having cavities or blind holes shall be tipped or rotated before being raised from the vapor layer.

(8) During start up, the primary condenser and the refrigerated freeboard device, if one is used, shall be turned on before the sump heater. During shutdown, the sump heater shall be turned off, and the solvent vapor layer allowed to collapse before the condenser water and refrigerated freeboard device are turned off.

(9) Porous or absorbent material shall not be degreased in an open top vapor degreaser.

(10) A routine inspection and maintenance program shall be implemented to reduce or prevent solvent losses from dripping drain taps, cracked gaskets and malfunctioning equipment. Leaks must be repaired as soon as they are discovered.

(11) Waste solvent, still, and sump bottoms shall be collected and stored in closed containers. The closed containers may contain a device that would allow pressure relief, but would not allow liquid solvent to drain from the container prior to disposal.

(12) Each owner shall provide a permanent label for each open top vapor degreaser which states the required work and operating practices. The label shall be placed near the front of the degreaser in full view of the degreaser operator and written in English, and in any other language that may be necessary for comprehension by personnel operating the degreaser. The label must be kept visible and legible at all times. The plant owner or operator shall ensure that each person who operates a degreaser understands the instructions on the label.

(13) When sumps are drained, solvent shall be transferred using threaded or other leakproof couplings.

(14) The carbon absorber bed shall not be bypassed during desorption.

(g) An owner or operator subject to the provisions of this subpart shall operate a conveyorized degreaser only if it conforms to the following design requirements:

(1) Each conveyorized degreaser shall have a freeboard ratio of at least 0.75.

(2) Each conveyorized degreaser shall be equipped with a drying tunnel, a rotating (tumbling) basked, hanging flaps, or other device to prevent cleaned parts from carrying out solvent liquid or vapor. When a drying tunnel is used, the air which moves through the tunnel to enhance drying shall be exhausted to a carbon adsorber. The concentration of organic solvent in the exhaust from this device may not exceed 25 ppm of any regulated halogenated organic compound as measured by Method 23 for the length of the carbon adsorber cycle or three hours, whichever is less. If other volatile organic compounds are used, then the emissions shall not exceed an average of 25 ppm as carbon, measured by Method 25 for the length of the carbon adsorber cycle or three hours, whichever is less.

(3) Each conveyorized degreaser shall be equipped with downtime port covers at the entrance and exit openings.

(4) Each conveyorized cold cleaner with a solvent-air interface area of 2.0m² (21.6 ft_s) or greater shall be equipped with a carbon adsorber. The concentration of organic solvent in the exhaust from this device may not exceed 25 ppm of any regulated halogenated organic compound as measured by Method 23 for the length of the carbon adsorber cycle or three hours, whichever is less. If other volatile organic compounds are used, then the emissions shall not exceed an average of 25 ppm as carbon, measured by Method 25 for the length of the carbon adsorber cycle or three hours, whichever is less.

(5) Each conveyorized vapor degreaser with a solvent-air interface of 2.0m² (21.6 ft²) or greater shall be equipped with one or more of the following equipment controls:

(i) A refrigerated freeboard device, or

(ii) A carbon adsorber. The concentration of organic solvent in the exhaust from this device shall not exceed 25 ppm of any regulated halogenated organic compound as measured by Method 23 for the length of the carbon adsorber cycle or three hours, whichever is less. If other volatile organic compounds are used, then the emissions shall not exceed an average of 25 ppm as carbon, measured by Method 25 for the length of the carbon adsorber cycle or three hours, whichever is less.

(6) Each conveyorized vapor degreaser shall be equipped with the following devices:

(i) A device which shuts off sump heat if sump liquid level drops down to the height of sump heater coils, and

(ii) A vapor level control device which shuts off sump heat if the vapor level rises above the height of the primary condenser coils.

(7) Each owner shall provide a permanent label for each conveyorized degreaser which states the required work and operating practices. The label shall be placed near the front of the degreaser in full view of the degreaser operator and written in English and in any other language that may be necessary for comprehension by personnel operating the degreaser. The label must be kept visible and legible at all times. The plant owner or operator shall ensure that each person who operates a degreaser understands the instructions on the label.

(8) Waste solvent, still, and sump bottoms shall be collected and stored in closed containers. The closed containers may contain a device that would allow pressure relief, but would not allow liquid solvent to drain from the container prior to disposal.

(9) The carbon adsorber bed shall not be bypassed during desorption.

§ 60.363 Equivalent methods of control.

Upon written application, the Administrator may approve the use of equipment or procedures after they have been demonstrated to his satisfaction to be equivalent, in terms of reducing solvent emissions to the atmosphere, to those prescribed for compliance within a specified paragraph of this subpart. The application must contain a complete description of the proposed testing procedure and the date, time, and location scheduled for the equivalency demonstration.

§ 60.364 Reporting and recordkeeping.

(a) The owner or operator of any degreaser affected by this subpart shall furnish the Administrator with a single report for each degreaser. These reports shall be submitted each quarter for all degreasers which were newly constructed, modified, or reconstructed and which were placed in operation or for which ownership was transferred in the previous quarter. Each report shall contain written notification (certification) of the following:

(1) Date construction, modification, or reconstruction of each degreaser was commenced.

(2) Make and model of degreaser (including the serial number if applicable).

(3) Name, date, and location to whom the ownership of the degreaser was transferred.

(4) Dimensions of the solvent-air interface area and the freeboard ratio.

(5) Specify whether a refrigerated freeboard device or carbon adsorber has been installed (if applicable) and certify that the required controls (design parameters), under section 60.362, are part of the degreaser for which this notification is required.

(6) The name, title, and signature of the individual making the certification.

(b) Each owner or operator of an affected facility subject to the provisions of this subpart, except as provided in paragraph (c) of this section, shall maintain records for a period of 2 years of the following:

(1) The amount and date of each purchase of new solvent.

(2) The name and/or type of solvent purchased.

(3) The amount, date, and method of disposal for spent solvent, sump bottoms, and/or still bottoms, as applicable.

(c) Each owner or operator of a cold cleaner with a solvent-air interface area of less than 1.0 m² (10.8 ft²) is not subject to the requirements of paragraph (b) of this section, but is required to maintain for a period of 2 years a record of the method of waste solvent disposal.

(d) The reporting and recordkeeping requirements under this section will automatically expire 5 years from the date of promulgation of this regulation unless affirmative action to extend them is taken by EPA. (Section 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.365 Waste disposal [Reserved]

§ 60.366 Test method.

(a) Reference Method 23 or 25 of Appendix A, as applicable, shall be used to determine compliance with the

requirements under § 60.382 when carbon adsorbers are used. The results shall be reported as ppm of organics (Method 23) or ppm or carbon (Method 25). Each performance test shall consist of 3 separate samples, and the arithmetic mean of the 3 samples shall be used to determine compliance.

(Section 114 of the Clean Air Act as amended (U.S.C. 7414))

3. Appendix A to part 60 is amended by adding reference method 23 as follows:

Appendix A—Reference Methods

* * * * *

Method 23. Determination of Halogenated Organics From Stationary Sources

Introduction

Performance of this method should not be attempted by persons unfamiliar with the operation of a gas chromatograph, nor by those who are unfamiliar with source sampling because knowledge beyond the scope of this presentation is required. Care must be exercised to prevent exposure of sampling personnel to hazardous emissions.

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of halogenated organics such as carbon tetracholoride, ethylene dichloride, perchloroethylene, trichloroethylene, Methylene chloride, 1,1,1-trichloroethane, and trichlorotrifluoroethane in stack gases from sources as specifiedd in the regulations. It does not apply when the halogenated organics are contained in particulate matter.

1.2 Principle. An integrated bag sample of stack gas containing one or more halogenated organics is subjected to gas chromatographic (GC) analysis, using a flame ionization detector (FID).

2. *Range and Sensitivity.* The range of this method is 0.1 to 200 ppm. The upper limit may be extended by extending the calibration range or by diluting the sample.

3. *Interferences.* The chromatograph column with the corresponding operating parameters herein described normally provides an adequate resolution of halogenated organics; however, resolution interferences may be encountered in some sources. Therefore, the chromatograph operator shall select the column best suited to his particular analysis problem, subject to the approval of the Administrator. Approval is automatic provided that confirming data are produced through an adequate supplemental analytical technique, e.g. analysis with a different column or GC/mass spectroscopy. This confirming data must be available for review by the Administrator.

4. *Apparatus.*

4.1 Sampling (see Figure 23–1). The sampling train consists of the following components:

4.1.1 Probe. Stainless steel, Pyrex* glass, or Teflon* tubing (as stack temperature permits), each equipped with a glass wool plug to remove particulate matter.

4.1.2 Sample Line. Teflon, 6.4-mm outside diameter, of sufficient length to connect probe to bag. Use a new unused piece for each series of bag samples that constitutes an emission test, and discard upon completion of the test.

4.1.3 Quick Connects. Stainless steel, male (2) and female (2), with ball checks (one pair without), located as shown in Figure 23–1.

4.1.4 Tedlar or Aluminized Mylar Bags. 100-liter capacity, to contain sample.

4.1.5 Bag Containers. Rigid leakproof containers for sample bags, with covering to protect contents from sunlight.

4.1.6 Needle Valve. To adjust sample flow rate.

4.1.7 Pump. Leak-free, with minimum of 2-liters/min capacity.

4.1.8 Charcoal Tube. To prevent admission of halogenated organics to the atmosphere in the vicinity of samplers.

4.1.9 Flow Meter. For observing sample flow rate; capable of measuring a flow range from 0.10 to 1.00 liter/min.

4.1.10 Connecting Tubing. Teflon, 6.4-mm outside diameter, to assemble sampling train (Figure 23–1).

4.2 Sample Recovery. Teflon tubing, 6.4-mm outside diameter, to connect bag to gas chromatograph sample loop is required for sample recovery. Use a new unused piece for each series of bag samples that constitutes an emission test and discard upon conclusion of analysis of those bags.

4.3. Analysis. The following equipment is needed:

4.3.1 Gas Chromatograph. With FID, potentiometric strip chart recorder, and 1.0- to 2.0-ml sampling loop in automatic sample valve. The chromatographic system shall be capable of producing a response to 0.1 ppm of the halogenated organic compound that is at least as great as the average noise level. (Response is measured from the average value of the baseline to the maximum of the waveform, while standard operating conditions are in use.)

4.3.2 Chromatographic Column. Stainless steel, 3.05 m by 3.2 mm, containing 20 percent SP–2100/0.1 percent Carbowax 1500 on 100/120 Supelcoport. The analyst may use other columns provided that the precision and accuracy of the analysis of standards are not impaired and he has available for review information conforming that there is adequate resolution of the halogenated organic compound peak. (Adequate resolution is defined as an area overlap of not more than 10 percent of the halogenated organic compound peak by an interferent peak. Calculation of area overlap is explained in Appendix E, Supplement A: "Determination of Adequate Chromatographic Peak Resolution."

4.3.3 Flow Meters (2). Rotameter type, 0-to-100-ml/min capacity.

4.3.4 Gas Regulators. For required gas cylinders.

4.3.5 Thermometer. Accurate to 1°C, to measure temperature of heated sample loop at time of sample injection.

4.3.6 Barometer. Accurate to 5 mm Hg, to measure atmospheric pressure around gas chromatograph during sample analysis.

4.3.7 Pump. Leak-free, with a minimum of 100-ml/min capacity.

4.3.8 Recorder. Strip chart type, optionally equipped with either disc or electronic integrator.

4.3.9 Planimeter. Optional, in place of disc or electronic integrator (4.3.8), to measure chromatograph peak areas.

4.4 Calibration. Sections 4.4.2 through 4.4.6 are for the optional procedure in Section 7.1.

4.4.1 Tubing. Teflon, 6.4-mm outside diameter, separate pieces marked for each calibration concentration.

4.4.2 Tedlar or Aluminized Mylar Bags. 50-liter capacity, with valve; separate bag marked for each calibration concentration.

4.4.3 Syringe. 25-μl, gas tight, individually calibrated, to dispense liquid halogenated organic solvent.

4.4.4 Syringe. 50-μl, gas tight, individually calibrated to dispense liquid halogenated organic solvent.

4.4.5 Dry Gas Meter, with Temperature and Pressure Gauges. Accurate to ±2 percent, to meter nitrogen in preparation of standard gas mixtures, calibrated at the flow rate used to prepare standards.

4.4.6 Midget Impinger/Hot Plate Assembly. To vaporize solvent.

5. *Reagents.* It is necessary that all reagents be of chromatographic grade.

5.1 Analysis. The following are needed for analysis:

5.1.1 Helium Gas or Nitrogen Gas. Zero grade, for chromatographic carrier gas.

5.1.2 Hydrogen Gas. Zero grade.

5.1.3 Oxygen Gas or Air. Zero grade, as required by the detector.

5.2 Calibration. Use one of the following options: either 5.2.1 and 5.2.2, or 5.2.3.

5.2.1 Halogenated Organic Compound, 99 Mol Percent Pure. Certified by the manufacturer to contain a minimum of 99 Mol percent of the particular halogenated organic compound; for use in the preparation of standard gas mixtures as described in Section 7.1.

5.2.2 Nitrogen Gas. Zero grade, for preparation of standard gas mixtures as described in Section 7.1.

5.2.3 Cylinder Standards (3). Gas mixture standards (200, 100, and 50 ppm of the halogenated organic compound of interest, in nitrogen). The tester may use these cylinder standards to directly prepare a chromatograph calibration curve as described in Section 7.2.2, if the following conditions are met: (a) The manufacturer certifies the gas composition with an accuracy of ±3 percent or better (see Section 5.2.3.1). (b) The manufacturer recommends a maximum shelf life over which the gas concentration does not change by greater than ±5 percent from the certified value. (c) The manufacturer affixes the date of gas cylinder preparation, certified concentration of the halogenated organic compound, and recommended maximum shelf life to the cylinder before shipment from the gas manufacturer to the buyer.

5.2.3.1 Cylinder Standards Certification. The manufacturer shall certify the concentration of the halogenated organic compound in nitrogen in each cylinder by (a) directly analyzing each cylinder and (b)

*Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

calibrating his analytical procedure on the day of cylinder analysis. To calibrate his analytical procedure, the manufacturer shall use, as a minimum, a three-point calibration curve. It is recommended that the manufacturer maintain (1) a high-concentration calibration standard (between 200 and 400 ppm) to prepare his calibration curve by an appropriate dilution technique and (2) a low-concentration calibration standard (between 50 and 100 ppm) to verify the dilution technique used. If the difference between the apparent concentration read from the calibration curve and the true concentration assigned to the low-concentration calibration standard exceeds 5 percent of the true concentration, the manufacturer shall determine the source of error and correct it, then repeat the three-point calibration.

5.2.3.2 Verification of Manufacturer's Calibration Standards. Before using, the manufacturer shall verify each calibration standard by (a) comparing it to gas mixtures prepared (with 99 Mol percent of the halogenated organic compounds) in accordance with the procedure described in Section 7.1 or by (b) having it analyzed by the National Bureau of Standards, if such analysis is available. The agreement between the initially determined concentration value and the verification concentration value must be within ±5 percent. The manufacturer must reverify all calibration standards on a time interval consistent with the shelf life of the cylinder standards sold.

5.2.4 Audit Cylinder Standards (2). Gas mixture standards with concentrations known only to the person supervising the analysis samples. The audit cylinder standards shall be identically prepared as those in Section 5.2.3 (the halogenated organic compounds of interest, in nitrogen). The concentrations of the audit cylinders should be: one low-concentration cylinder in the range of 25 to 50 ppm, and one high-concentration cylinder in the range of 200 to 300 ppm. When available, the tester may obtain audit cylinders by contacting: Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Quality Assurance Branch (MD–77), Research Triangle Park, North Carolina 27711. If audit cylinders are not available at the Environmental Protection Agency, the tester must secure an alternative source.

6. *Procedure*

6.1 Sampling. Assemble the sampling train as shown in Figure 23–1. Perform a bag leak check according to Section 7.3.2. Join the quick connects as illustrated, and determine that all connections between the bag and the probe are tight. Place the end of the probe at the centroid of the stack and start the pump with the needle valve adjusted to yield a flow that will more than half fill the bag in the specified sample period. After allowing sufficient time to purge the line several times, connect the vacuum line to the bag and evacuate the bag until the rotameter indicates no flow. At all times, direct the gas exiting the rotameter away from sampling personnel.

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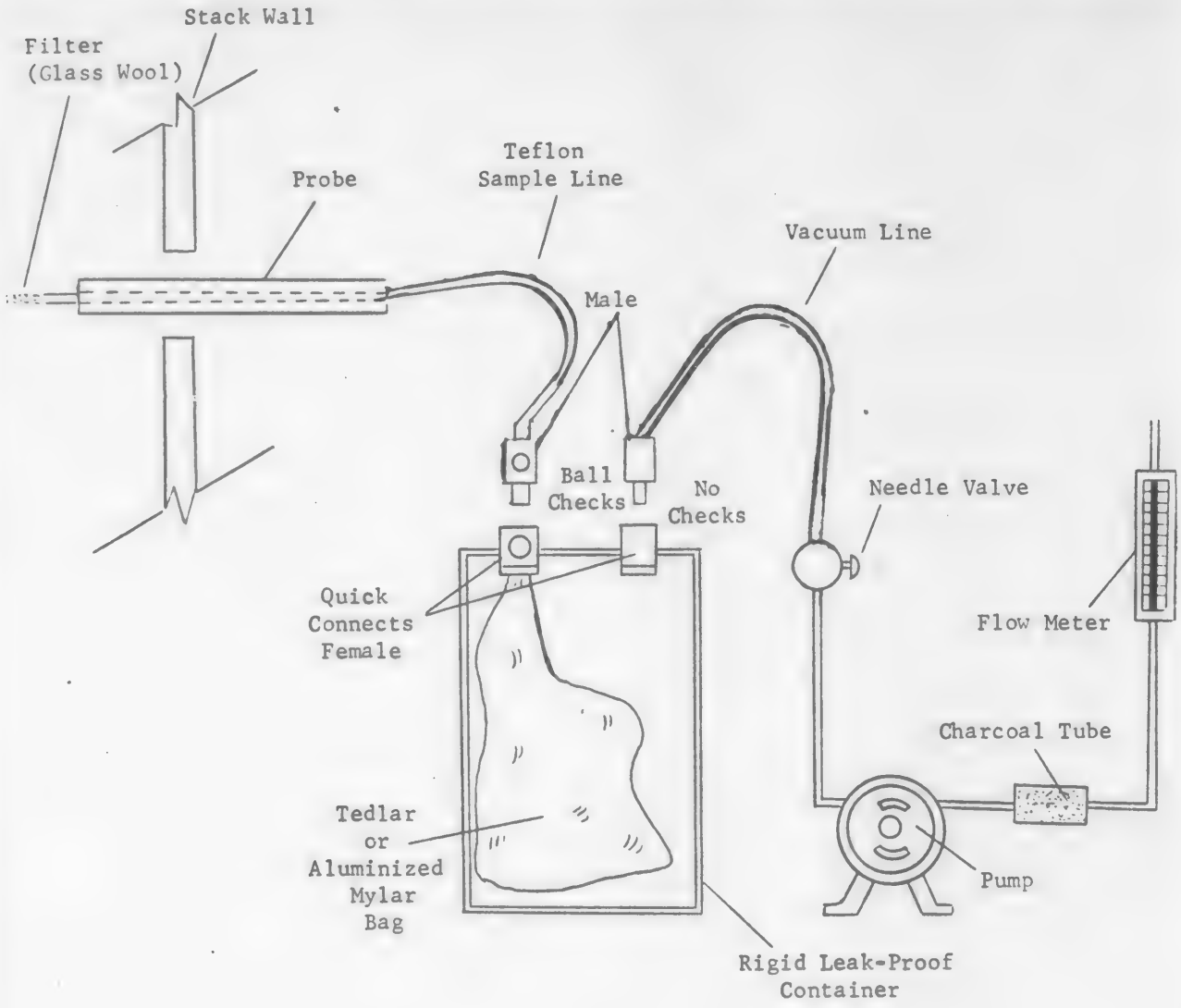

Figure 23-1. Integrated-bag sampling train. (Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.)

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Then reposition the sample and vacuum lines and begin the actual sampling, keeping the rate constant. At the end of the sample period, shut off the pump, disconnect the sample line from the bag, and disconnect the vacuum line from the bag container. Protect bag container from sunlight.

6.2 Sample Storage. Keep the sample bags out of direct sunlight and protect from heat. Perform the analysis within 1 day of sample collection for methylene chloride, ethylene dichloride, and trichlorotrifluoroethane, and within 2 days for perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, and carbon tetrachloride.

6.3 Sample Recovery. With a new piece of Teflon tubing identified for that bag, connect a bag inlet valve to the gas chromatograph sample valve. Switch the valve to receive gas from the bag through the sample loop. Arrange the equipment so the sample gas passes from the sample valve to a 0-to-100-ml/min rotameter with flow control valve followed by a charcoal tube and a 0-to1-in. H_2O pressure gauge. The tester may maintain the sample flow either by a vacuum pump or container pressurization if the collection bag remains in the rigid container. After sample loop purging is ceased, allow the pressure guage to return to zero before activating the gas sampling valve.

6.4 Analysis. Set the colum temperature to 100°C and the detector temperature to 225°C. When optimum hydrogen and oxygen flow rates have been determined, verify and maintain these flow rates during all chromatograph operations. Using zero helium or nitrogen as the carrier gas, establish a flow rate in the range consistent with the manufacturer's requirements for satisfactory detector operation. A flow rate of approximately 20 ml/min should produce adequate separations. Observe the base line periodically and determine that the noise level has stabilized and that base-line drift has ceased. Purge the sample loop for 30 sec at the rate of 100 ml/min, then activate the sample valve. Record the injection time (the position of the pen on the chart at the time of sample injection), the sample number, the sample loop temperature, the column temperature, carrier gas flow rate, chart speed, and the attenuator setting. Record the barometric pressure. From the chart, note the peak having the retention time corresponding to the halogenated organic compound, as determined in Section 7.2.1. Measure the halogenated organic compound peak area, A_m, by use of a disc integrator, electronic integrator, or a planimeter. Record A_m and the retention time. Repeat the injection at least two times or until two consective values for the total area of the peak do not vary more than 5 percent. Use the average value for these two total areas to compute the bag concentration.

6.5 Determination of Bag Water Vapor Content. Measure the ambient temperature and barometric pressure near the bag. From a water saturation vapor pressure table, determine and record the water vapor content of the bag as a decimal figure. (Assume the relative humidity to be 100 percent unless a lesser value is known.)

7. *Preparation of Standard Gas Mixtures, Calibration, and Quality Assurance.*

7.1 Preparation of Standard Gas Mixtures. (Optional procedure—delete if cylinder standards are used.) Assemble the apparatus shown in Figure 23–2. Check that all fittings are tight. Evacuate a 50-liter Tedlar or aluminized Mylar bag that has passed a leak check (described in Section 7.3.2) and meter in about 50 liters of nitrogen. Measure the barometric pressure, the relative pressure at the dry gas meter, and the temperature at the dry gas meter. Refer to Table 23–1. While the bag is filling, use the 50-μl syringe to inject through the septum on top of the impinger, the quantity required to yield a concentration of 200 ppm. In a like manner, use the 25-μl syringe to prepare bags having approximately 100- and 50-ppm concentrations. To calculate the specific concentrations, refer to Section 8.1. (Tedlar bag gas mixture standards or methylene chloride, ethylene dichloride, and trichlorotrifluoroethane may be used for 1 day, trichloroethylene and 1,1,1-trichloroethane for 2 days, and perchloroethylene and carbon tetrachloride for 10 days from the date of preparation. (Caution: If the new gas mixture standard is a lower concentration than the previous gas mixture standard, contamination may be a problem when a bag is reused.)

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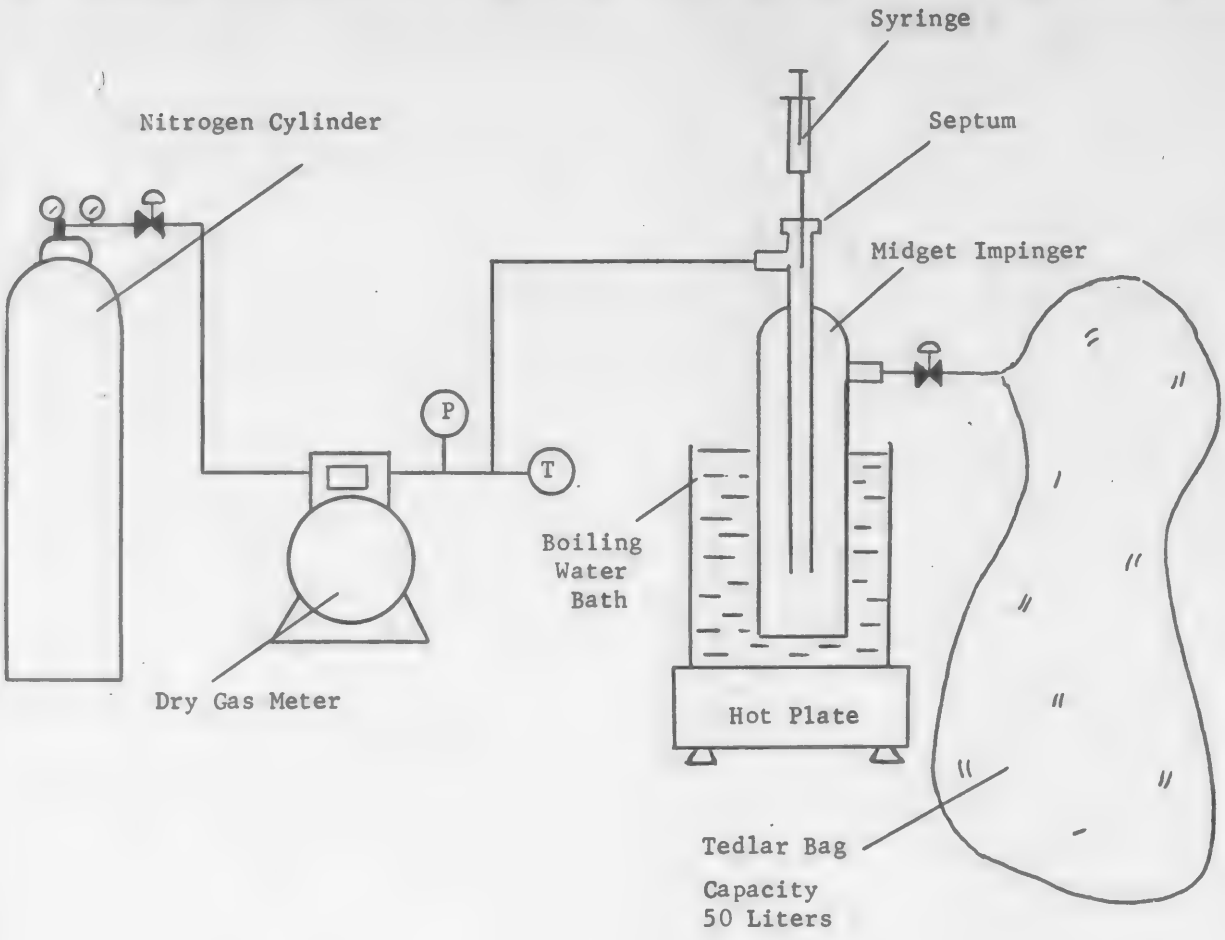

Figure 23-2. Preparation of Standards.
(optional)

TABLE 23-1. INJECTION VALUES FOR PREPARATION OF STANDARDS (Optional, See Section 7.1)

Compound	Molecular Weight g/g-mole	Density at 293°K g/ml	µl/50 liters of N_2 required for approximate concentration of: 200 ppm	100 ppm	50 ppm
Perchloroethylene C_2Cl_4	165.85	1.6230	42.5	21.2	10.6
Trichloroethylene C_2HCl_3	131.40	1.4649	37.3	18.6	9.3
1,1,1-Trichloroethane $C_2H_3Cl_3$	133.42	1.4384	38.6	19.3	9.6
Methylene Chloride CH_2Cl_2	84.94	1.3255	26.6	13.3	6.7
Trichlorotrifluoroethane $C_2Cl_3F_3$	187.38	1.5790	49.3	24.7	12.3
Carbon Tetrachloride CCl_4	153.84	1.5940	40.1	20.1	10.0
Ethylene Dichloride $C_2H_4Cl_2$	98.96	1.2569	32.7	16.4	8.2

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7.2 Calibration.

7.2.1 Determination of Halogenated Organic Compound Retention Time. (This section can be performed simultaneously with Section 7.2.2.) Establish chromatograph conditions identical with those in Section 6.4. above. Determine proper attenuator position. Flush the sampling loop with zero helium or nitrogen and activate the sample valve. Record the injection time, the sample loop temperature, the column temperature, the carrier gas flow rate, the chart speed, and the attenuator setting. Record peaks and detector responses that occur in the absence of the halogenated organic. Maintain conditions (with the equipment plumbing arranged identically to Section 6.3), flush the sample loop for 30 sec. at the rate of 100 ml/min with one of the halogenated organic compound calibration mixtures, and activate the sample valve. Record the injection time. Select the peak that corresponds to the halogenated organic compound. Measure the distance on the chart from the injection time to the time at which the peak maximum occurs. This distance divided by the chart speed is defined as the halogenated organic compound peak retention time. Since it is possible that there will be other organics present in the sample, it is very important that positive identification of the Halogenated organic compound peak be made.

7.2.2 Preparation of Chromatograph Calibration Curve. Make a gas chromatographic measurement of each Standard gas mixture (described in Section 5.2.3 or 7.1) using conditions identical with those listed in Sections 6.3 and 6.4. Flush the sampling loop for 30 sec at the rate of 100 ml/min with one of the standard gas mixtures and activate the sample valve. Record C_c, the concentration of halogenated organic injected, the attenuator setting, chart speed, peak area, sample loop temperature, column temperature, carrier gas flow rate, and retention time. Record the laboratory pressure. Calculate A_c, the peak area multipled by the attenuator setting. Repeat until two consecutive injection areas are within 5 percent, then plot the average of those two values versus C_c. When the other standard gas mixtures have been similarly analyzed and plotted, draw a straight line through the points derived by the least squares method. Perform calibration daily, or before and after each set of bag samples, whichever is more frequent.

7.3 Quality Assurance.

7.3.1 Analysis Audit. Immediately after the preparation of the calibration curve and prior to the sample analyses, perform the analysis audit described in Appendix E, Supplement B: "Procedure for Field Auditing GC Analysis."

7.3.2 Bag Leak Checks. While performance of this section is required subsequent to bag use, it is also advised that it be performed prior to bag use. After each use, make sure a bag did not develop leaks by connecting a water manometer and pressurizing the bag to 5 to 10 cm H_2O (2 to 4 in. H_2O). Allow to stand for 10 min. Any displacement in the water manometer indicates a leak. Also, check the rigid container for leaks in this manner. (Note: An alternative leak check method is to pressurize the bag to 5 to 10 cm H_2O (2 to 4 in. H_2O) and allow to stand overnight. A deflated bag indicates a leak.) For each sample bag in its rigid container, place a rotameter in line between the bag and the pump inlet. Evacuate the bag. Failure of the rotameter to register zero flow when the bag appears to be empty indicates a leak.

8. *Calculations.*

8.1 Optional Procedure Standards Concentrations. Calculate each halogenated organic standard concentration (C_c in ppm) prepared in accordance with Section 7.1 as follows:

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$$C_c = \frac{\frac{BD}{M}(24.055 \times 10^3)}{V_m Y \frac{293}{T_m} \frac{P_m}{760}} = 6.240 \times 10^4 \frac{BD}{M} \frac{T_m}{V_m Y P_m}$$

Eq. 23-1

Where:

B = Volume of halogenated organic injected, µl.

D = Density of compound at 293°K, g/ml.

M = Molecular weight of compound, g/g-mole.

V_m = Gas volume measured by dry gas meter, liters.

Y = Dry gas meter calibration factor, dimensionless.

P_m = Absolute pressure of dry gas meter, mm Hg.

T_m = Absolute temperature of dry gas meter, °K.

24.055 = Ideal gas molal volume at 293° K and 760 mm Hg, liters/g-mole.

10^3 = Conversion factor. [(ppm)(ml)]/µl.

8.2 Sample Concentrations. From the calibration curve described in Section 7.2.2 above, select the value of C_c that corresponds to A_c. Calculate C_s, the concentration of halogenated organic in the sample (in ppm), as follows:

$$C_s = \frac{C_c P_r T_i}{P_i T_r (1-S_{wb})}$$

Eq. 23-2

Where:

C_c = Concentration of the halogenated organic indicated by the gas chromatograph, ppm.

P_r = Reference pressure, the laboratory pressure recorded during calibration, mm Hg.

T_i = Sample loop temperature at the time of analysis, °K.

P_i = Laboratory pressure at time of analysis, mm Hg.

T_r = Reference temperature, the sample loop temperature recorded during calibration, °K.

S_{wb} = Water vapor content of the bag sample, volume fraction.

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9. *References.*

1. Feairheller, W. H., A. M. Kemmer, B. J. Warner, and D. Q. Douglas. Measurement of Gaseous Organic Compound Emissions by Gas Chromatography. EPA Contract No. 68–02–1404, Task 33 and 68–02–2818, Work Assignment 3. January 1978. Revised by EPA August 1978.

2. Supelico, Inc. Separation of Hydrocarbons. Bulletin 747. Belleforte, Pennsylvania. 1974.

3. Communication from Joseph E. Knoll. Percholoroethylene Analysis by Gas Chromatography. March 8, 1978.

4. Communication from Joseph E. Knoll. Test Method for Halogenated Hydrocarbons. December 20, 1978.

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(Sections 111(b), 111(d), 114, and 301(a) of the Clean Air Act as amended (42 U.S.C. 7411, 7414, and 7601(a)))

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